in a general way is off the Celebrass shoal, about forty miles from the Tonga Islands, toward the Fiji Islands. Its position is approximately in latitude 20° 28′ south, and longitude 175° 21′ west from Greenwich. Further details are expected by another steamer. The island was photographed by the British consul to Samoa, who was a passenger.

ASTRONOMICAL NOTES.

Harvard college observatory.— Professor Pickering's annual report was presented to the visiting committee on Dec. 3, and shows most gratifying progress in the work, in spite of the serious curtailment of the income of the observatory during the past year. The fifteen-inch equatorial is still devoted largely to photometry ; and, besides a large amount of routine work accomplished, a series of observations of the temporary star which recently appeared in the nebula of Andromeda was obtained. Professor Rogers's excellent work with the meridian circle continues, and the reduction of his zone is nearly ready for the press. The meridian photometer also has been in active operation. By the aid of the Bache fund an important investigation has been undertaken in stellar photography, which has already been referred to (*Science*, vi. 443). Mr. Chandler's work with his almucantar we have noticed from time to time, and we look forward with much interest to the publication of a detailed description and theory of the instrument, which it is understood he has prepared. The telegraphic distribution of important astronomical discoveries, for which this observatory is the American centre, has been successfully continued under the supervision of Mr. Ritchie.

The Lick observatory.—The Clarks have made wonderfully rapid progress with the crown-glass disk of the immense three-foot lens for the Lick observatory. The work of grinding was begun on the crown-disk about two months ago, and already they are able to set up the lens for examination by artificial light. The flint-disk has been practically ready for some time, and, with continued favorable progress, they hope to finish the objective by the autumn of 1886. It has not yet been decided who is to make the mounting for the instrument, or the dome which is to cover it. We notice that the thirty-inch objective for the Nice observatory has just been finished by the Henry brothers, and that it has been sent to M. Gautier, who has charge of the construction of the equatorial; the whole to be mounted at Nice in April, 1886.

The Biela meteor-shower. — Reports from Europe show that we in this country entirely missed the thickest part of the meteor-shower of Nov. 27, as it had dwindled to comparatively insignificant proportions when our twilight came on. From various places in England and on the continent, where the sky was clear on the 27th, come reports of brilliant showers, sometimes too rapid for counting, and in many cases exceeding sixty per minute for a single observer. They were also very bright, and left trains continuing visible in some cases as long as 30^{s}, and frequently appeared almost simultaneously in bunches of five, eight, or ten. These were all early in the evening for European longitudes, and we shall have to wait for reports from farther east, in Arabia or India, perhaps even from Dr. Doberck at Hongkong, before we can be sure that we have heard of the maximum activity of the shower. This seems to have been well heralded in advance. The earliest observations thus far reported are by Mr. Barnard of Nashville, Tenn., who observed twenty or thirty meteors from the Biela radiant during an interval of two or three hours of clear sky on the evening of Nov. 25 ; and both he, and Mr. Denning of Bristol, England, counted them at the rate of one hundred or more per hour on the evening of the 26th. On the 27th none of the comets in this country appear to have exceeded two hundred or three hundred per hour for a single observer, and Mr. Denning reports that those of the 28th were very small and insignificant in a clear sky at Bristol.

New star in Orion.—A complete set of observations of the new star discovered by Mr. J. E. Gore, an English astronomer, on Dec. 13, was obtained at Harvard college observatory on Dec. 16, — the very evening on which the despatch was received from Lord Crawford, — settling the non-identity of the star with D.M. + 20°, 1172, the star named in the despatch. A meridian circle observation by Professor Rogers gave for the position of the *nova* R.A. 5^{h} 49^{m} 4^{s}.25 : Dec. + 20° 9′ 15″.6. Professor Pickering's photometric measures made the magnitude 6.2, and the spectroscope showed the existence of bright bands. Two excellent photographs fixing the position of the star with reference to neighboring stars were obtained, and one photograph of the spectrum. The indications are suggestive of the new star being a long-period variable, and there was a slight suspicion of a diminution in magnitude during the first six or seven hours it was under observation.

METEOROLOGICAL NOTES.

An unusual tornado. — The Alabama weather-service report for November describes the tornadoes that occurred on the 6th of that month. At Decatur the storm is reported to have come

from the south-east, a very unusual direction for tornadoes. The report concludes with a well-emphasized note.

Meteorology in New England. — The Bulletin of the New England meteorological society for the same month is based on reports from 136 observers. The precipitation is found to be 0.96 inch more than the average for ten or more Novembers at 31 stations, and the temperature is 2°.5 above the average. Storms on the 1–3d, 5–9th, and 22–29th, were the chief disturbances of the month. Wind-velocities by anemometer record are given for thirteen stations. Blue Hill had a maximum velocity of 65 miles an hour from the south-east during the storm of the 25–26th, with a total run of 15,389 miles for the month. The Eastport, Boston, and Block Island records for the same are 45 and 8,513, 46 and 9,338, 47 and 13,344, respectively. The tides during the last of the three storms were very high, owing to the concurrence of strong easterly winds, with the time of new moon and the moon's nearest approach to the earth. An increase in the number of stations around Brattleborough, Vt., is noticeable on the map.

Prediction of tornadoes. — A lecture on 'Tornado study' was recently delivered before the Franklin institute in Philadelphia by Lieut. J. P. Finley of the signal office. Probably no one in the country is more conversant with the facts and features of tornado occurrence than Lieutenant Finley, who has made a special study of these destructive storms for a number of years past. Their peculiar characteristics were described, and an account was given of the fifteen hundred volunteer tornado reporters who observe and report on these storms in all parts of the country, according to a plan devised by Lieutenant Finley. It was also announced that predictions of tornadoes are now attempted successfully, although they are not yet published. A dangerous attitude of weather conditions for the eastern middle states was recognized in the morning of Aug. 3 last, and in the afternoon tornadoes occurred at Philadelphia and thereabout.

Cold waves. — A signal-service note, xxiii., is a preliminary study of 'Cold waves and their progress,' by Lieut. T. A. Woodruff. They are found to follow an area of low, and to precede an area of high pressure, but their cause is not considered. Within our territory they nearly always appear first at Helena, Montana, and it is concluded that "they have their origin in the vast regions of ice and snow near the arctic circle far to the north of our stations." It is possible that records from the British north-west territory might disprove this conclusion; for in the winter, when the cold waves are most frequent, it is not always the polar regions that are coldest. The waves are found to move in different ways: 1°, directly eastward, over the great lakes and across New England, not being felt south of the Ohio valley; 2°, south-easterly, covering the entire country in their progress; 3°, southerly, from Montana and Dakota to Texas, thence through the Gulf states, and finally north-eastward over the Atlantic states, such waves being sometimes felt at St. Louis and Shreveport before reaching St. Paul and Chicago. The number of waves belonging to the three classes during the first six months of the years 1881 to 1884 was 22, 47, and 19. The second class thus appears more frequently than the other two combined. Fifty per cent of the waves appeared simultaneously at Bismarck and Helena. They generally reach Omaha eight to sixteen hours after their appearance at Helena, the distance being 880 miles; St. Louis, 24 to 32 hours, distance 1,030 miles; Galveston, 24 to 40 hours, distance, 1,600 miles; Nashville, the same; Buffalo, 24 to 48 hours, distance 1,750 miles; Washington, 32 to 56 hours, distance 1,953 miles. The difficulty in the prediction of the waves is the same that embarrasses the prediction of storm-centre tracks, for the former follow the latter. There has as yet been no tabulation published by the signal office of the conditions attending the early appearance of areas of low pressure, which afterwards take different directions in crossing the country. A special description is given in the note of the cold wave of March 18, 1883, in which the fall of temperature in twenty-four hours was generally 20° to 40° over the country. The most marked falls of temperature follow well-developed storms, and accompany an area of abnormally high pressure.

NOTES AND NEWS.

UNDER the will of the late Henry N. Johnson, and by the death of his widow in February, 1885, the Academy of natural sciences of Philadelphia, named as residuary legatee, has come into the possession of his entire estate, valued at $51,761.40. The present annual income from the productive portion, less taxes and water-rent, is $1,434.82.

— In many respects this is a golden age for children. This is true in the matter of school-books no less than in children's literature. In the 'new eclectic series of geographies,' Van Antwerp, Bragg & Co. have attempted to make the elementary study of geography attractive to children, and presumably with success. Their 'Complete geography' is excellent in its fulness,